

Modeling the Interaction of Light with Plasmonic Nanoparticles

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Abstract

Plasmonic nanoparticles have received increased interest due to their numerous potential applications in the field of optics and optoelectronics. Currently such metallic nanoparticles are applied in semiconductor devices, such as light emitting diodes (LEDs) and solar cells. The optical behaviour of a single plasmonic nanoparticle is can be easily described with several analytic or semianalytic methods (e.g. quasistatic approximation, Mie-theory). However for modeling the interaction of a nanoparticle dimer with polarized light we have to use numerical simulations.

When the spacing between the nanoparticles is small, there are strong electric field between the nanoparticles. Finite element simulation is very efficient in this case, for describing the strong plasmonic field around the particles. In this work we model the scattered electromagnetic field of a silver nanoparticle dimer interacting with light with different polarization. We calculate the absorption and scattering cross section with different interparticle distance and polarization. The results show that the interaction of nanoparticles is very sensitive for the polarization and for the interpartical spacing. For these simulations we used COMSOL Multiphysics® with the RF Module.